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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/831,508	05/10/2001	Nobuki Matsui	819-540	5656

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09/06/2005

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EXAMINER

DUONG, THANH P

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 09/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/831,508

Applicant(s)

MATSUI ET AL.

Examiner

Tom P. Duong

Art Unit

1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4 and 7-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4 and 7-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicants' remarks and amendments filed on June 23, 2005 have been carefully considered. Claims 1, 4, 7-8, 10-15 and 17 have been amended. Claims 2, 3, and 5-6 have been canceled. Claims 1, 4, and 7-17 are pending in this application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 4, 7-11, 13, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson '625 in view of Lahn et al. '456. Regarding claims 1, 4, and 9-10, Clawson discloses a hydrogen gas generator (Fig. 2) for generating hydrogen from a family, oxygen, and steam, source fuel of the hydrocarbon (Col. 3, lines 28-36) said hydrogen gas generator comprising a fuel reformer (ATR and Col. 3, lines 53-56) with a catalyst (Col. 12, lines 5-10) which exhibits an activity to a partial oxidation reaction of said source fuel; wherein said source fuel, oxygen, and steam are supplied to said reformer (ATR) so that said partial oxidation reaction (POx) occurs on said catalyst and a water gas shift reaction (Col. 4, lines 7-10) occurs in which CO produced in said partial oxidation reaction is a reactant, the H₂O/C ratio (S/C), which is the ratio of the number of moles of said steam to the number of moles of carbon of said source fuel,

is not less than 0.5 or not more than 3.0 (Col. 31, lines 65-67), the ratio of CO₂ to CO in an outlet gas of said fuel reformer (Fig. 2), is not less than 0.2 (Col. 4, lines 45-49), the hydrogen gas generator with outlet gas temperature of said fuel reformer (ATR) is not more than 800 degrees centigrade (Col. 21, lines 15-20 and Col. 22, lines 1-2).

Clawson discloses proper control of air/fuel (Col. 19, lines 48-55) but fails to disclose the ratio of the number of moles of said oxygen to the number of moles of carbon of said source fuel less than 0.9 times the O₂/C theoretical mixture ratio in said partial oxidation reaction, and the O₂/C ratio is not more than 1.5 times O₂/C theoretical mixture ratio. Lahn '456 teaches the oxygen and alkane feed molar ratio is about 0.2 to 1.0 and the O₂ is added to provide the sensible heat for reactants and to maintain the overall reaction temperature at a desired level in the reaction zone (Col. 6, lines 3-15). Thus, it would have been obvious in view of Lahn to one having ordinary skill in the art to modify the control system of Clawson with proper O₂/C ratio as taught by Lahn in order to maintain the desired operating temperature in the reformer. Regarding claim 7, Lahn teaches the O₂/alkane feed ratio is 0.2 to 1.0 and the O₂/CH₄ is 0.5 to 1.0 in the POx {CH₄ + 1/2O₂ = CO + 2H₂}. In order to complete the conversion of methane gas to synthesis gas in the POx, it is obvious in view of Lahn that Clawson '625 has a ratio of the number of moles of oxygen to the number of moles of carbon of said source fuel greater than said O₂/C theoretical mixture ratio in the Pox or at most thru routine optimization. Regarding claim 11, Clawson discloses the use of catalysts is formed of at least rhodium and ruthenium (Col. 12, lines 1-9). Regarding claim 13, Clawson discloses a fuel cell capable of generating electricity by making use of hydrogen fuel

(Col. 1, lines 48-52). Regarding claim 17, Clawson discloses air supply means for supplying air to fuel cell (Fig. 26).

2. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (Clawson '625 in view of Lahn et al. '456) as applied to claim 11 above, and further in view Madgavkar et al. (4,186,801). The applied references disclose the claimed invention except the catalyst is supported on a honeycomb monolith carrier. Madgavkar teaches oxidation catalyst is carried on by an inert support structure such as a honeycomb monolith carrier and such structure provides the benefits of supporting the catalyst and minimizes the pressure drop across the bed (Col. 5, lines 35-54). Thus, it would have been obvious in view of Madgavkar to one having ordinary skill in the art to modify the hydrogen gas generator of the applied references with a catalyst of honeycomb monolith carrier as taught by Madgavkar in order to gain the above benefits.

3. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (Clawson '625 in view of Lahn et al. '456) as applied to claim 13 above, and further in view of Negishi '633. Regarding claim 14, the applied references fail to disclose a discharged gas supply means (35) for supplying a steam-containing gas, discharged from an oxygen electrode of said fuel cell, to said fuel reformer (5) for a supply of steam to said fuel reformer (5). Negishi teaches the

oxidizing exhaust gas (via 73) from the oxygen electrode is recycled to the air tank 36 then to a reformer 22 to maximize the utilization of the fuel (Col. 15 lines 4-5). Thus, it would have been obvious in view of Negishi to one having ordinary skill in the art to modify the hydrogen gas generator of the applied references with oxidizing exhaust gas stream 73 as taught by Negishi in order to maximize the utilization of the fuel.

4. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (Clawson '625 in view of Lahn et al. '456) as applied to claim 13 above, and further in view of Harashima '641. Regarding claim 15, the applied references fail to disclose output current control means (38) for controlling the output current said fuel cell so that the oxygen concentration and the steam concentration of a discharged gas that is supplied to said fuel reformer (5) fall within their respective given ranges. Harashima teaches the control system 5, which measures the output current from the power inverter system 4 and compares the output current with the reference point, and then sends the correct current signal to adjust the flow rate of G1, G2, G3, and A to minimize the load fluctuation (Col. 1, lines 53-67 and Col. 2, lines 1-30). Thus, it would have been obvious in view of Harashima to one having ordinary skill in the art to modify the device of the applied references with control means as taught by Harashima in order to minimize load fluctuation in the fuel cell power supply. Regarding claim 16, the applied references fail to disclose the output current control means for controlling the output current of said fuel cell so that the coefficient of utilization of oxygen of said fuel cell ranges from 0.4 to 0.75. Harashima teaches the control system

5 with sensor to detect output current from power inverting system 4 and compares the output current with the reference current, and then adjusts the oxygen (air flow rate A) to the fuel cell (Col. 1, lines 53-67 and Col. 2, lines 1-30). Such output current control means provides the benefit of minimizing load fluctuation in the fuel cell power supply. Thus, it would have been obvious in view of Harashima to one having ordinary skill in the art to modify the device of the applied references with output current control means as taught by Harashima to minimize load fluctuation in the fuel cell power supply.

Although, the applied references do not expressly disclose the coefficient of oxygen of fuel cell ranges from 0.4 to 0.75; however, the applied references in view of Harashima appear to provide a control system that optimizes the utilization of oxygen in the fuel cell and it would have been obvious to obtain such coefficient values thru fine tuning of the control elements. Also, adjusting the output current control means to obtain an optimum operating conditions would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made (See *In re Boesch*, 617 F.2d.272,205 USPQ 215 (CCPA 1980)) and (See *In re Aller*, 105 USPQ 223).

Response to Arguments

Applicant's arguments filed June 23, 2005 have been fully considered but they are not persuasive. The 102(b) rejection anticipated by Lahn is withdrawn and the argument is moot. (1) With respect to Applicants' argument of Clawson fails to disclose a ratio of CO₂/CO is not less than 0.2. Examiner respectfully disagrees. Clawson clearly discloses the carbon monoxide content of the gas exiting the shift reactor can be

as low as 0.5 mol percent (0.005 mol CO) (Col. 4, lines 45-49). Thus, the ratio of CO₂/CO is not less than 0.2. (2) With respect to the argument of the combination of Clawson and Lahn, *"the water gas shift reaction of Lahn et al. does not occur in the fuel reformer while Clawson et al. discloses that the water gas shift reaction does occur in the reformers. Consequently, it is respectfully submitted that one of ordinary skill in the art would not combine the references in the manner suggested by the Examiner,"* Examiner respectfully disagrees. Lahn clearly teaches the steam-reforming partial oxidation (Col. 6, lines 1-10) or an auto-reforming (ATR) which has both the reforming and POX reactions occur in the reformer. Note, Clawson discloses the claimed invention except the feed O₂/C ratio and Lahn teaches the benefit of using the feed O₂/C ratio of the claimed invention and it would have been obvious to combine the feed ratio of O₂/C of Lahn in the Clawson's invention as described above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not


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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom P. Duong whose telephone number is (571) 272-2794. The examiner can normally be reached on 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tom Duong
August 24, 2005
TD 


Glenn Caldarola
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